

Name:

Solutions

1. Solve  $x^2 + 16 = 0$

$$\begin{aligned}x^2 &= -16 \\ \sqrt{x^2} &= \pm \sqrt{-16} \\ x &= \pm i\sqrt{16}\end{aligned}$$
$$\begin{aligned}x &= \pm i \cdot 4 \\ x &= \pm 4i\end{aligned}$$
$$\{4i, -4i\}$$

2. Solve  $k^3 - 5k = 0$

$$\begin{aligned}k(k^2 - 5) &= 0 \\ k = 0 \quad k^2 - 5 &= 0 \\ k^2 &= 5 \\ \sqrt{k^2} &= \pm \sqrt{5}\end{aligned}$$
$$\begin{aligned}k &= \pm \sqrt{5} \\ \{0, \sqrt{5}, -\sqrt{5}\}\end{aligned}$$

3. Solve  $p^2 + 6p + 10 = 0$ .

DNF

$$\begin{aligned}p &= \frac{-6 \pm \sqrt{6^2 - 4(1)(10)}}{2(1)} \\ p &= \frac{-6 \pm \sqrt{36 - 40}}{2} \\ p &= \frac{-6 \pm \sqrt{-4}}{2}\end{aligned}$$
$$\begin{aligned}p &= \frac{-6 \pm i\sqrt{4}}{2} \\ p &= \frac{-6 \pm i \cdot 2}{2} \\ p &= -3 \pm i \\ \{-3 + i, -3 - i\}\end{aligned}$$

4. Solve  $x^3 - 2x^2 - 12x + 24 = 0$

$$\begin{aligned}x^2(x - 2) - 12(x - 2) &= 0 \\ (x - 2)(x^2 - 12) &= 0 \\ (x - 2) = 0 \quad x^2 - 12 &= 0 \\ x = 2 \quad x^2 &= 12 \\ x &= \pm \sqrt{12} \\ x &= \pm \sqrt{4 \cdot 3} \\ x &= \pm 2\sqrt{3}\end{aligned}$$
$$\{2, 2\sqrt{3}, -2\sqrt{3}\}$$

5. Write an equation (in standard form) of the polynomial function with solution set  $\{10i, -10i\}$  and with degree 2.

$$\begin{aligned}
 x &= 10i \quad x = -10i \\
 x - 10i &= 0 \quad x + 10i = 0 \\
 (x - 10i)(x + 10i) &= 0 \\
 x^2 + 10ix - 10ix - 100i^2 &= 0 \\
 x^2 - 100(-1) &= 0 \quad \curvearrowright \quad x^2 + 100 = 0
 \end{aligned}$$

6. Write an equation (in standard form) of the polynomial function with solution set  $\{-2, \sqrt{7}, -\sqrt{7}\}$  and with degree 3.

$$\begin{aligned}
 x &= -2 \quad x = \sqrt{7} \quad x = -\sqrt{7} \\
 x + 2 &= 0 \quad x - \sqrt{7} = 0 \quad x + \sqrt{7} = 0 \\
 (x + 2)(x - \sqrt{7})(x + \sqrt{7}) &= 0 \\
 (x + 2)(x^2 + \sqrt{7}x - \sqrt{7}x - \sqrt{49}) &= 0 \\
 (x + 2)(x^2 - 7) &= 0 \\
 x^3 + 2x^2 - 7x - 14 &= 0
 \end{aligned}$$

7. Simplify  $\frac{8x+24}{4}$

$$2x + 6$$

8. Simplify  $\frac{2x^2 - 5x - 12}{2x^2 + 13x + 15}$

$$= \frac{\cancel{(2x+3)}(x-4)}{\cancel{(2x+3)}(x+5)} = \frac{x-4}{x+5}$$

9. Simplify  $\frac{m^2 - 49}{m^2 - 14m + 49} \cdot \frac{m^2 - 13m + 42}{m^2 + 7m}$

$$= \frac{(\cancel{m-7})(\cancel{m+7})(m-6)(\cancel{m-7})}{(\cancel{m-7})(\cancel{m-7}) \cdot m(\cancel{m+7})} = \frac{m-6}{m}$$

10. Simplify  $\frac{p^3 + 1}{p^3 - 8} \div \frac{p+1}{p-2}$

$$= \frac{(\cancel{p+1})(p^2 - p + 1)}{(\cancel{p-2})(p^2 + 2p + 4)} \cdot \frac{\cancel{p-2}}{\cancel{p+1}}$$

$$= \frac{p^2 - p + 1}{p^2 + 2p + 4}$$

11. State all real number restrictions on  $x$ :  $\frac{x^2 + 64}{3x^2 - 27x}$

$$3x^2 - 27x \neq 0$$

$$3x(x-9) \neq 0$$

$$3x \neq 0 \quad x-9 \neq 0$$

$$x \neq 0 \quad x \neq 9$$

$$x \neq 0$$

$$x \neq 9$$

12. State all real number restrictions on  $x$ :  $\frac{x^2 - 10x + 25}{x^2 + 4}$

$x^2 + 4$  cannot become zero from real numbers.

There are no real number restrictions on the domain of the function.